HELLENIC REPUBLIC
HELLENIC BUREAU FOR MARINE CASUALTIES INVESTIGATION

MARINE CASUALTY SAFETY INVESTIGATION REPORT 02/2016

Fatal injury of a truck driver onboard Ro/Ro EUROCARGO TRIESTE

December 2024

Contents

Foreword

The Hellenic Bureau for Marine Casualties Investigations (HBMCI) was established by Law 4033/2011 (Government Gazette 264/22.12.2011), in the context of implementing EU Directive 2009/18/EC.

HBMCI conducts technical investigations into marine casualties or marine incidents with the sole objective to identify and ascertain the circumstances and contributing factors that caused it through analysis and to draw useful conclusions and lessons learned that may lead, if necessary, to safety recommendations addressed to parties involved or stakeholders interested in the marine casualty, aiming to prevent or avoid similar future marine accidents.

The conduct of Safety Investigations into marine casualties or incidents is independent from criminal, discipline, administrative or civil proceedings whose purpose is to apportion blame or determine liability.

This investigation report has been produced without taking under consideration any administrative, disciplinary, judicial (civil or criminal) proceedings and with no litigation in mind. It does not constitute legal advice in any way and should not be construed as such. It seeks to apprehend the sequence of events occurred on the 6th October 2016 that resulted in the examined very serious marine casualty.

Fragmentary or partial disposal of the contents of this report, for other purposes than those produced may lead to misleading conclusions.

The investigation report has been prepared in accordance with the format of Annex I of respective Law (Directive 2009/18/EC) and all times quoted are local times unless otherwise stated.

Within the aforementioned framework HBMCI examined the fatal injury of a truck driver, on board Ro/Ro EUROCARGO TRIESTE during her loading operations in the port of Patras, Greece, on the 6th of October2016.

This report is based on information and evidence that have derived mostly from the interview process as well as vessel´s documents and Safety Management System.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

1.	AB	Able seaman
2.	DOC	Document of compliance
3.	C/O	Chief Officer
4.	CSM	Cargo Securing Manual
5.	gt	gross tonnage
6.	HCG	Hellenic Coast Guard
7.	IMO	International Maritime Organization
8.	ISM	International Management Code for the safe operation of ships and for pollution prevention
9.	LT	local time
10.	O/S	Ordinary Seaman
11.	RO	Recognized Organization. An organization which meets the relevant conditions set forth by respective international legislation and has been authorized by the Flag State Administration to provide the necessary statutory services and certification to ships entitled to fly its flag.
12.	RINA	Registro Italiano Navale
13.	Ro/Ro	(roll-on/roll-off passenger ship) a RORO vessel built for freight vehicle transport along with passenger accommodation. Technically this encompasses all ferries with both a roll-on/roll-off car deck and passenger-carrying capacities.
14.	SMC	Safety management certificate
15.	SMS	Safety management system
16.	SOLAS	International Convention for the Safety of Life at Sea 1974, as applied
17.	UTC	Universal Coordinated Time

1. Executive summary

On the 06th of October 2016, at 09:30 Eurocargo Trieste arrived at Patras Port having completed her voyage from Bari and berthed with her stern at Dock “D” and loading ramp was secured ashore. The unloading operation of all vehicles was completed by 11:20 and at approximately 12:20, the loading operation commenced.

At approximately 12:30 the involved in the casualty truck, entered in garage space on Deck 3. The driver maneuvered it within loading lane no. 2 and parked it alongside the fore starboard bulkhead. At approximately 12:40 and while the truck’s left side (driver’s side) was lined up alongside the garage’s starboard bulkhead, the driver stepped off the tractor΄s cabin, probably to proceed with the setting of the trailer΄s retractable landing gear and thus got himself in the limited space zone between the truck semi-trailer and the vessel΄s bulkhead.

At that moment while the driver was lowering the landing gear, the truck moved towards the ship’s aft, due to the fact that the parking brake had not been engaged, before getting off the tractor’s cabin. This resulted in the injury of the driver as he was trapped between the landing gear’s left leg and garage΄s starboard side bulkhead.

The accident was reported to the local Coast Guard Authority by the vessel’s Master and medical assistance was requested. An ambulance was dispatched on board at approximately 12:55 pm and the injured driver was transferred to the local hospital. However, he succumbed to the severe injuries and died at the hospital.

At 19:30 Eurocargo Trieste sailed from Patras Port and continued her planned voyage to Bari, as part of her scheduled voyage itinerary.

The investigation conducted, indicatively identified as the main factor leading to the casualty, the parking brake, which was not engaged by the truck driver.

Three recommendations are addressed to the vessel’s Managing Company, to train the assigned crew members, in order to supervise and control effectively the loading/unloading operations; examine the risk factors of swap bodies’ stowage in the garage spaces and supplement vessel’s Cargo Securing Manual in order to ensure that there is specific instructions for transportation of this type of cargo; and place signs and labels on visible places in garage spaces in order to draw driver’s attention for applying every time the parking brake and engaging the engine gear if necessary, before stepping out of the truck.

Additionally one recommendation is addressed to the owner of the truck to establish clear instructions to the drivers in order to ensure that before they exit their truck they apply the parking brakes of their vehicles.

2. FACTUAL INFORMATION

2.1 Particularsof Eurocargo Trieste

Name of Vessel	Eurocargo Trieste
Call Sign	9HA3276
Owner	MALTA MOTORWAYS OF THE SEA LIMITED
Operating Company	VALIANT SHIPPING S.A.
Flag State	Malta
Port of Registry	Valletta
IMO Number	9131515
Type of Vessel	Ro/Ro Cargo
Classification Society	RINA
Yearbuilt	1997
ShipYard	Fincantieri Cantieri Naval iItaliani/ Trieste Italy
Construction	Steel
LOA (Length over all)	185.00
Breadth	25.20
Gross tonnage	26536
Net Tonnage	9872
Main Engine	2 x MAN B & W
Engine Power /Speed	2 x 12510 KW / 22 knots
Document of Compliance	RO RINA
Safety Management Cert.	RO RINA

2.2 Voyage Particulars

Vessel´s name	Eurocargo Trieste
Port of departure	Bari - Italy
Port of arrival	Patra – Greece
Type of voyage	International
Cargo information	Loaded with 103 vehicles and 150 passengers
Manning	26 crew members

2.3 Marine casualty information

Vessel´s name	Eurocargo Trieste
Type of casualty	Very serious marine casualty
Date and time	06October2016 at approximately 12:40
Position	Patras New Port / Dock “D”-lat: 38º 50.83’N / long:021º 43.20E
External environment	Wind force 3Bfs – sea state smooth visibility very good - day time
Ship operation	Loading operation
Damages to ship	None (minor scratches on garage stb dbulkhead)
Damage to equipment	None
Fatalities / Injuries	Fatal injury of a truck driver / None

3. Narrative

Note: The sequence of the events in relation to times and positions of individuals involved are mostly based on statements.

3.1 Description of Ro-Ro Eurocargo Trieste

Eurocargo Trieste, classed as Ro-Ro cargo ship, was built in 1997 by "Fincatieri Cantieri Navale" in Italy, having capacity of 11,600DWT/26,536 GT, constructed with a four (04) car deck arrangement (Figure 1).

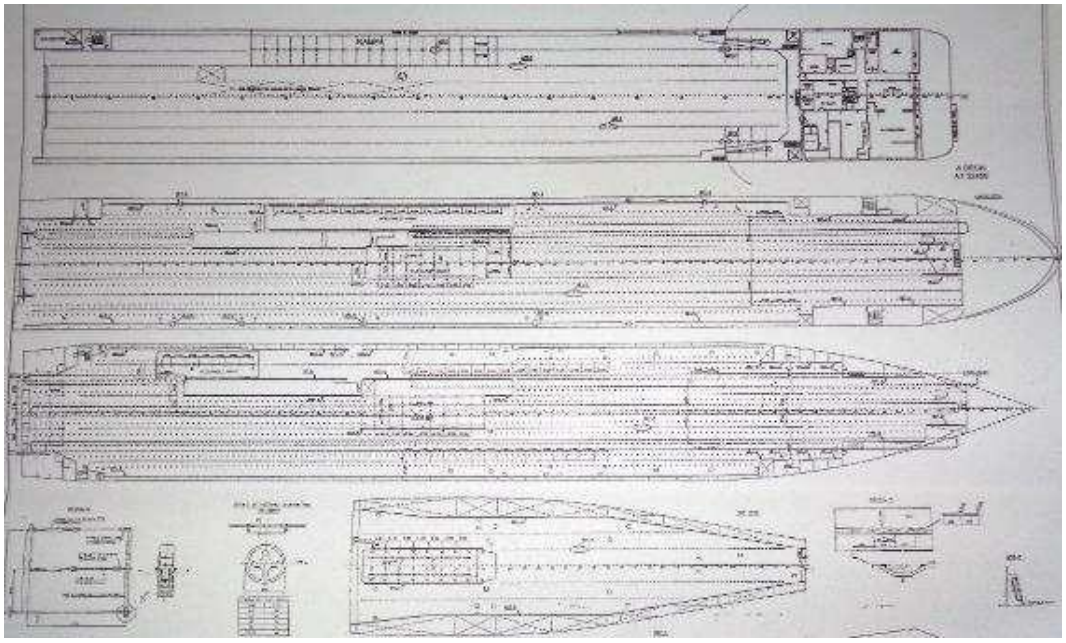

Figure 1: Depiction of the General arrangement plan

She was equipped with a single loading stern hydraulically driven ramp, fitted on her no. 2 garage deck (main deck) (Figure 2).

At the time of the marine accident, she was flying the flag of Malta, was registered with RINA Class and was trading in the Mediterranean region, conducting round voyages between Italy and Greece, calling at the ports of Ravenna, Bari, Venice (Italy) and Patras (Greece).

Figure 2: The single loading stern hydraulically driven ramp fitted on no. 2 garage deck (main deck).

3.2 Cargo operations at Patras Port

On the 06th of October 2016, Eurocargo Trieste arrived at the port of Patras Port and berthed by stern at Dock "D". The unloading operation of vehicles, trucks and unaccompanied cargo units commenced shortly after and was completed at approximately 11:20.

The loading operation began at approximately 12:20, with the Chief Officer (C/O) supervising the process. Two deck Officers, the Bosun and deck ratings were responsible for directing the truck trailers into the garage spaces and to their stowage positions, and securing them with the lashing equipment. One Deck Officer and three crew members were positioned on garage deck No. 2 and one Deck Officer with three crew members were positioned on garage deck No.3. Both groups were assigned to direct trucks to parking lanes; assist maneuvering at the stowage positions and secure wheeled based cargos or cargo units with the lashing equipment.

The standard procedure for loading articulated vehicles[1], such as truck semi-trailers or rigid truck with drawbar as the one involved in the examined case, was that following the maneuvering, parking, and stowing procedure, the semi-trailer was disconnected from the tractor and/or the cargo units were released from the drawbar trailer, as explained in the next paragraph.

3.3 The involved rigid truck with drawbar trailer

The first vehicle to enter Eurocargo Trieste was the one involved in the casualty. It was a rigid truck with drawbar trailer[2](figure 3).

On 05th of October 2016 at approximately 17:30, the rigid truck had departed from the Logistic Company's establishments in Schimatari District, Attica Province, transporting

[1] An **articulated vehicle** is a vehicle which has a pivot joint that allows the vehicle to easily turn and maneuver. Any vehicle towing a trailer could be described as articulated. Truck semi-trailers are articulated vehicles.

[2] A **rigid truck with drawbar trailer,** is a combination of a truck coupled with one wheeled trailer and another wheeled trailer attached with a raw bar, capable of transporting cargo units that in the road transportation mode are called "Swap Bodies".

two swap bodies[3] (cargo units) and arrived at Patras port at around 21:30. The truck driver was reported to have parked at the designated parking area for trucks and rested.

On the 06th of October 2016, following Eurocargo Trieste's unloading completion, the truck driver drove towards the loading ramp and entered garage deck No 2.

According to the information collected, firstly he would park the drawbar trailer at the stowage position and release the two swap bodies (containers) by disengaging them from the chassis, then drive the same tractor overboard to attach two more swap bodies, parked in Patras port and load them on Eurocargo Trieste following the aforementioned procedure.

Figure 3: The rigid truck with drawbar trailer involved in the marine casualty. All supporting legs of the right trailer's side are lowered. Photo taken during the reconstruction of the accident.

3.4 The occurrence

When the rigid truck entered Eurocargo Trieste, the C/O ordered one O/S positioned at garage deck No.2 to guide the truck driver to the stowage spot which was regularly used for the cargo units of truck's company. The O/S guided the driver from main garage deck No.2 to the garage on deck No.3 through the ramp (Figure 4).

[3] A **swap body** (or *swop body*, *exchangeable container* or *interchangeable unit*.) is one of the types of standard freight containers for road and rail transport, based on bottom frames. Their design is similar to ISO standards shipping containers. However swap bodies do not have upper corner fittings, are not stackable, and must be lifted by the bottom frame. The bottom frame is designed and structured with four legs that can be deployed to support them.

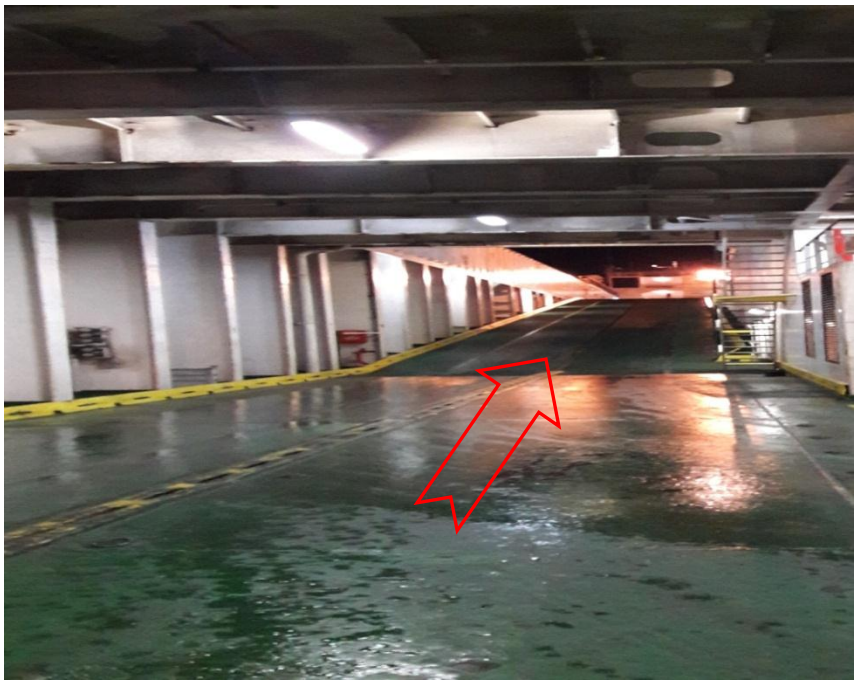

Figure 4: The fixed ramp on garage deck no. 2 leading to garage deck no. 3.

The stowage position was located at the starboard forward end of garage deck number 3 and was indicated by the Ordinary Seaman (O/S) who arrived at the location. At approximately 12:30 the driver maneuvered and aligned the rigid truck within no. 2 parking lane; reversed it towards the vessel's fore and parked it alongside the starboard garage bulkhead of the engine room entrance (figures 4 & 5).

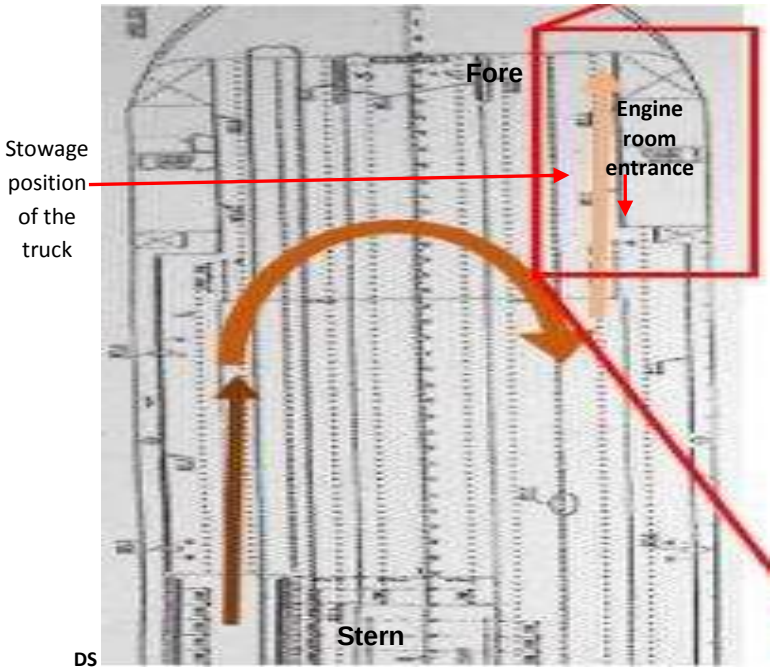

Figure 4: Sketch of the track manoeuvering to stoawge position on garage deck no. 3.

Figure 5: The rigid truck parked next to the engine room entrance bulkhead after the accident.

When the driver positioned the truck into the parking lane, he stepped off the cabin in order to release the supporting legs of the bottom frames, (eight in total - two in each trailer's side). Then he would lower the chassis of the trailers, using the cabled remote control mounted in the tractor's cabin which operated the air suspension system of the trailers.

The driver proceeded with setting, at first, the outer side's supporting legs starting from the truck's front (Figure 6) and continued to the inner side's supporting legs starting from the truck's rear end towards the front.

Figure 6. The two supporting legs fitted on the first trailer's outer side and the cabled remote control for the operation of the chassis' air suspension system.

For setting the supporting legs on the left side of the trailers he had to move within the limited space of about 50cm of width, formed between the trailers' side and the bulkhead (figure 7).

Figure 7: The space formed between the truck trailers and the engine room entrance bulkhead. Photo taken during the reconstruction of the accident.

At approximately 12:40 the driver had released and positioned the last forward supporting leg of the forward trailer. It is estimated that the total process for the release of the landing gear[4] lasts approximately 6 to 7 minutes. By that time all supporting legs had been set, however they had not been landed on deck as the trailers' chassis had not been lowered yet.

At that time, the rigged truck started unexpectedly moving forward and towards the bulkhead as the tractor's wheels were slightly turned to the left and the parking brake had not been engaged before the driver stepped off the tractor's cabin. It was also reported during the investigation process that the driver's door was closed and the tractor's engine was off.

As the driver was still standing close to the forward supporting leg, it pushed and forced him against the bulkhead. Consequently, he got trapped between the left supporting leg of the landing gear and the bulkhead (Figure 8).

Figure 8: Estimated position of the driver trapped between the trailer and the bulkhead. Photo taken during the reconstruction of the accident.

During the inspection of the involved in the casualty truck it was observed that when the

[4] Landing gear: the swap bodies' bottom frame supporting legs that mount and stabilize the cargo units.

parking brake system was not engaged a visual indication as well as an audible alarm was activated (figure 9). On this ground, it is considered possible that when the truck driver stepped off the cabin without engaging the parking brake he either did not notice the visual indication and did not hear the audible alarm, probably due to the noise of the garage, or he acted purposely.

Figure 9: The parking brake lever and the visual indication on tractor cockpit.

3.5 Emergency response actions

When the truck started moving and trapped the driver between the bulkhead and the left supporting leg of the landing gear, the O/S that guided the truck to the stowage position, was standing at the outer side of the rear trailer and was preparing the lashing equipment for securing the cargo units (Figure 10).

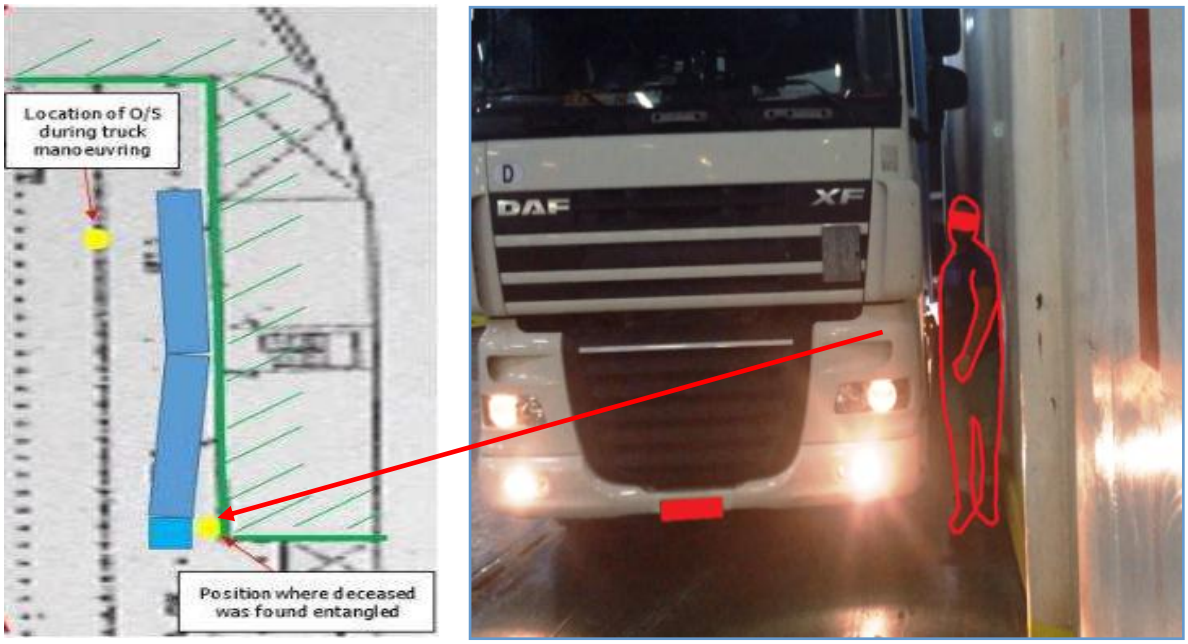

Figure 10: Location of O/S and the driver at the moment of the marine casualty

The O/S heard the driver calling for assistance and when he saw him trapped he

immediately reported the emergency situation to the C/O.

The C/O went immediately to the scene as well as the Deck Officers and other crew members. The driver was still conscious, yet he was breathing heavily and could not properly communicate.

The C/O reported the accident and the emergency situation to the Master who immediately reported it to the Coast Guard Authority of Patras and requested for medical assistance and transportation to a hospital.

Subsequently, C/O called another truck driver who entered into the tractor's cabin and engaged the brake.

It was decided to shift backwards the truck trailer in order to release and recover the injured driver. To mitigate the risk of further injuring the trapped driver by operating the tractor, three port tug master vehicles[5] were summoned on scene and smoothly hauled the rigid truck backwards by using towing chains.

At about 12:55 the seriously injured driver was released. At that time an ambulance of the National Emergency Aid Center arrived on the spot. First aid was provided and the casualty was transferred to the local hospital, however, due to his severe injuries, his vital signs eventually faded.

According to the postmortem examination there were no indication of alcohol or drugs use, that could impair the driver's performance.

3.6 Post actions to the occurrence

For the investigation purposes, the HBMCI Investigation team requested the technical inspection of the truck trailer involved in the incident. On the 11th of October 2016 the inspection was conducted at the Vehicle Technical Inspection & Control Centre of Patras (Figure 11).

[5]Tug master vehicle: Specialized vehicles for handling uncoupled semi-trailers, yard tractors, industrial tractors and road/rail tractors which are used in ports, heavy industry, shipyards etc.

Figure 11: Truck on Vehicle Technical Inspection & Control Centre

According to the results of the inspection, the tractor and the trailer were found to have serious issues on their braking systems. More specifically, the tractor's parking braking ratio was found less than the minimum dedicated performance ratio[6]. Moreover, the tires of the truck were found in worn condition. A test was also carried out on the truck's parking brake, including its audible alarm, without any issue.

As a result of the aforementioned findings, the road worthiness certificate of the truck was withdrawn and the owner was required to rectify the issues within 2 months and proceed for re-inspection.

Nonetheless, taking into consideration the evolution of events leading to the occurrence, the condition of the truck is not considered as a contributing factor to the marine casualty, as it was concluded that the parking brake was not engaged.

4. Analysis

The analysis of the examined marine casualty aims to identify and determine the factors and causes contributed to the occurrence, taking into account the sequence of events and the collection of the investigation information and data focusing both on specific points of the temporal evolution of these, as well as to the root causes in order to draw useful conclusions leading to possible safety recommendations.

Taking into consideration that the occurrence under examination:

- → is not directly related with the procedures for the safe stowage of vehicles or wheel-based cargo units on deck for transportation by sea; however,
- → it involves the actions and process to secure the trucks before safe stowage; and
- → the rigid truck´s procedures in order to disengage the cargo units;

this investigation amongst other issues is focusing on the measures or procedures directly or indirectly deriving, under the respective regulatory framework, from any documented instructions set forth in Eurocargo Trieste´s Cargo Securing Manual - CSM

[6] that is 16% of the maximum permitted mass and 12% of the maximum permitted combined mass

and Safety Management System - SMS for the loading operation of trucks, trucks semitrailers that had been implemented, could mitigate the risk and prevented the fatal injury of the truck driver.

4.1 Crew

Eurocargo Trieste was operating under a crew complement of 26 seafarers including the Master, of Bulgarian and Philippine nationalities. The working language was English.

All crew members were certified in accordance with the relevant requirements of the STCW Convention.

Each crew member of Eurocargo Trieste, as per her SMS familiarization procedure, was informed and aware of the Company's SMS policy, procedures and targets to be achieved. This task was recorded within the onboard familiarization process.

4.1.1 Master

The Master, aged 31, had serviced on Ro-Ro ferries for several years and this was his second contract as a Master on Eurocargo Trieste. He was a holder of Bulgarian Certificate of Competency permitting him to sail as Master on vessels, of 500 GT and above, on international voyages. He was familiar with Ro-Ro operations and experienced in operating in the Adriatic routes. He had joined the vessel on June 2016. At the time of the accident, he was in his cabin.

4.1.2 C/O

The C/O, aged 36, had been employed on Ro-Ro ferries for 5 years and this was his second contract as a C/O on board Eurocargo Trieste. He had acquired a Bulgarian Certificate of Competency permitting him to sail as C/O on vessels, of 500 G.T and above, on international voyages. He had joined the vessel on August of 2016. By the time of the accident the C/O was coordinating the vehicle loading operation on the stern ramp.

4.1.3 O/S

The O/S that was on scene at the time of the casualty, aged 38, had a sea experience of 5 years on Bulk Carriers and 3 years on Ro-Ro vessels and this was his third contract on Eurocargo Trieste. He had joined the vessel on February of 2016. At the time of the accident the O/S was at the outer side of the involved trailer preparing the lashing equipment.

4.2 Environmental conditions

In the morning hours of the 06th of October 2016, weather conditions were good with winds 3 Bf of variable directions and good visibility. At the time of the accident Eurocargo Trieste was safely berthed at Patras Port.

4.3 Fatigue

Having examined the working and resting hours of Eurocargo Trieste's crew, it was concluded that the working arrangement pattern were followed according to the respective provisions and there was no evidence to indicate that the performance of the involved crew into the examined case was affected by fatigue.

However, it is worth highlighting that fatigue is also affected by the quality of sleep or rest which is challenging to verify during the investigation process.

4.4 Stowage and securing

4.4.1 Stowage and securing regulatory framework

Ro-Ro vessels are built for vehicles and freight vehicles transport along with passenger accommodation. They are primary designed to carry wheeled cargo such as cars, trucks, semi-trailers etc. that are driven on and off the vessel as well as other unaccompanied cargo units such as portable tanks, containers and so forth that are loaded by specialized trucks.

Resolution A.581 (14) «Guidelines for securing arrangements for the transport of road vehicles on ro-ro ships», adopted on 20 November 1985, as amended by MSC./Circ.812 and MSC.1/Circ.1355 has set out guidelines in order to enhance the safe transportation of road vehicles on Ro-Ro vessels, targeting in a unified implementation at an international basis.

Additionally by Resolution A.714 (17), as applied[7], on 6 November 1991 the «Code of Safe Practice for Cargo Stowage and Securing» was adopted, and in view of Resolution A. 581 (14), inter alia, a composite international framework to promote the safe stowage and securing of cargo units on board ships, including packing or loading cargo in road vehicles and freight containers was set forth and urged the provisions to be included in the CSM which is carried on board ships, following the provisions of MSC/Circ.385, as replaced by MSC/Circ.745 and superseded by MSC.1/Circ.1353.

The «Code of Safe Practice for Cargo Stowage and Securing» is structured in seven (07) Chapters and lists thirteen (13) Annexes, as presented below:

Chapter 1: General
Chapter 2: General Principles of safe stowage & securing of cargoes
Chapter3: Standardized stowage & securing systems
Chapter 4: Semi-standardized stowage & securing
Chapter5: Non-standardized stowage & securing
Chapter 6: Actions which may be taken in heavy Weather.
Chapter 7: Actions which may be taken once cargo has shifted

Annex 1: Safe stowage and securing of containers on deck of ships which are not specially designed and fitted for the purpose of carrying containers.
Annex 2: Safe stowage and securing of portable tanks.
Annex 3: Safe stowage and securing of portable receptacles.
Annex 4: Safe stowage and securing of
Annex 8: Safe stowage and securing of anchor chains
Annex 9: Safe stowage and securing of metal scrap in bulk
Annex 10: Safe stowage and securing of flexible intermediate bulk containers (FIBCs)
Annex 11: General guidelines for the under-deck stowage of logs

[7] Resolution A.714 (17), as amended by MSC/Circ.664; MSC/Circ.691; MSC/Circ.740; MSC/Circ.812; MSC/Circ.1026; MSC.1/Circ.1352; MSC.1/Circ.1352/Rev.1.

wheel-based (rolling) cargoes.
Annex 5: Safe stowage and securing of heavy cargo items such as locomotives, transformers etc.
Annex 6: Safe stowage and securing of coiled sheet steel.
Annex 7: Safe stowage and securing of heavy metal products
Annex 12: Safe stowage and securing of unit loads
Annex 13: Methods to assess the efficiency of securing arrangements for non-standardized cargo

It is noted that both resolutions in relation to wheeled cargo (coupled or uncoupled truck semi-trailers) mainly address technical issues for the «transport by sea» of Road Vehicles on Ro-Ro vessels, such as:

- ✓ the securing arrangements for the transport;
- ✓ the safe load, stowage and securing of cargo units (wheeled or not);
- ✓ the fixed and portable equipment for lashing off-road vehicles; wheeled cargo units or not that are loaded, stowed and secured for transportation «by sea».

Taking under consideration the examined case and the evolution of the events that led to the casualty and in principle the facts that:

- the swap bodies carried by the truck would be transported by sea as unaccompanied cargo units; and
- the rigid truck had to safely park and stop for a short time period by applying the brakes;
- the swap bodies frames had to be released from the truck's trailer;
- the swap bodies to be stowed and secured on deck by their landing gear; and
- the truck had to be driven off Eurocargo Trieste's garage deck,

the following provisions of aforesaid resolutions, related with the parking and brake process, are considered to apply:

Resolution A.581 (14)
Guidelines for securing arrangements for the transport of road vehicles on RO-RO ships

par. 7. STOWAGE

7.8 Stowage should be arranged in accordance with the following:

.1 The parking brakes of each vehicle or of each element of a combination of vehicles should be applied and locked.

Resolution A.714 (17)
Code of Safe Practice for Cargo Stowage and Securing

Annex 4: Safe stowage and securing of wheel-based (rolling) cargoes

2. General recommendations

2.5 When in stowage position, the brakes of a wheel-based unit, if so equipped, should be set.

4.4.2 Eurocargo Trieste Cargo Securing Manual

In conformity with the international legislation applied for the stowage and securing of freight road vehicles and cargo units, as well as the provided guidelines by IMO for the

preparation of the CSM in accordance with SOLAS Chapter VI/Reg. 5.6, Eurocargo Trieste was carrying her CSM which was approved by her Class based on the Flag Administration's delegation of authority.

4.4.2.1 Securing of loaded vehicles by parking brakes

Aforementioned provisions in par. 4.4.1 were included in Eurocargo Trieste's CSM as well as those considered to be related with the examined case and more specifically referring to parking brakes of road vehicles or wheeled based cargo units that are loaded, stowed and secured for sea transportation as presented below:

Provisions	Eurocargo Trieste CSM
Res.A.581(14) par. 7.8.1.1	Chapter 4, titled: «*Lashing Systems Manual / Commercial Vehicles - Combination of vehicles - Semi trailer - Road Train - Articulated road train - Lashing patterns» in par.* *Stowage:* «*The parking brakes of each trailer or of each element of combination of trailers should be applied and locked.».*
Res. A.714 (17) Annex 4, par. 2.5	Chapter 3, titled: *«Stowage and Securing of non standardized and semi standardized cargo»* Annex 4, titled: *«Safe storage and securing of wheel based (rolling cargo)», in par. 2.5:* *«When in stowage position, the brakes of a wheel-based unit, if so equipped, should be set.».*

Considering the above and in view that Eurocargo Trieste's CSM generated requirements to the Master and competent Officers and crew, it derives that stowage process and in particular parking and securing of trucks, was falling within the duties of the Officers in charge with the loading and unloading operation and the crew involved.

It is therefore concluded that Eurocargo Trieste involved personnel in the stowage process of vehicles have to take the necessary measures to reassure that the parking and securing of vehicles, before lashing, by applying the parking brake is effectively carried out by drivers.

4.4.2.2 Identified sources of danger

Eurocargo Trieste's CSM in Chapter 1, titled «GENERAL», in subparagraph 1.3 «Principal sources of danger», listed nine highlighted causes that according to the Company were evaluated as: «…*important sources of danger which can affect the safety of roll on/ roll off ships and of persons on them*.».

The identified causes are recorded below:

1. Cargo badly stowed or inadequately secured inside or on cargo units.
2. Free surface effects in tank vehicles, tank containers or other bulk units which are slack.
3. Poorly maintained ramps, lifts and stern
7. Insufficient or incorrectly applied lashings or the use of lashing equipment of the wrong type or of inadequate strength with respect to mass and centre of gravity of the cargo unit and the weather conditions likely to be encountered during voyage.

doors. 4. Poorly maintained or inadequately illuminated decks. 5. Wet decks. 6. **Failure to apply brakes correctly.**	8. Free play in the suspension of vehicles. 9. Failure to comply with the stowage, segregation and marking requirements for vehicles carry dangerous goods.

Highlighted item (6) underlined the importance of applying brakes when a vehicle (car, truck, truck semi-trailer etc.) is in stowage position (within the parking lane), in order to be secured, once parked and avoid any shifting that could endanger crew's or passenger's life or cause damages to other vehicles or the ship.

4.4.2.3 Cargo Securing Manual general principals

In addition to the above, Eurocargo Trieste's CSM in Chapter 3, titled «Stowage and securing of non-standardized cargo», Par. 3.1 «Handling and safety instructions», subparagraph 3.1.1 «General principals of cargo securing», recorded 22 items that were elaborating instructions and preconditions for the safe procedures of loading, stowage and securing of cargo units, the lashing devices and equipment used and so forth.

The following general principles for cargo securing, as numbered in CSM par. 3.1.1, are considered to imply with the examined case:

Eurocargo Trieste Cargo Securing Manual	
Chapter 3 «Stowage and securing of non-standardized cargo» Par. 3.1 «Handling and safety instructions»	***Sub. 3.1.1 «General principals of cargo securing»*** ⇒ no. 4, *pointing up that «Relevant personnel should be properly qualified and experienced and should have a sound practical knowledge of the application and content of this Cargo Securing Manual»*; ⇒ no.14, *referring to uncoupled semi-trailers that, once disconnected from the tractor, have to be supported by trestles (trailer horse) and remain on brakes until they are connected with a tractor at the port of call;* ⇒ no. 22, *Highlighting that «parking brakes, where provided, of each vehicle or each element of a combination of vehicles shall be applied».*

In view of the above presented provisions, it can be inferred that the securing of vehicles, trucks etc., before lashing, by firstly applying the parking brake was incorporated in Eurocargo Trieste's CSM stowage procedures while failure to apply parking brakes correctly was also pinpointed as a cause of danger to the vessel and the persons on board. Taking into consideration the above as well as the fact that Eurocargo Trieste's CSM generated requirements to the Master and competent Officers and crew, it derives that the stowage process and more specifically awareness for engaging parking brakes for

securing the vehicles and trucks, falls within the duties of the Officers and crew involved with the loading and unloading operation.

It can therefore be concluded that Eurocargo Trieste involved personnel in the stowage process of vehicles, had to take the necessary measures concerning the parking and securing procedure of vehicles, with the effective application of the parking brake by the drivers of the vehicles to be loaded.

Under the above and taking into account the evolution of the events that led to the examined marine casualty and more specifically the fact that the O/S who guided the rigid truck on garage deck no.3 and by the time the casualty occurred was standing at the rear of the semi-trailer, it is considered that he was not engaged in confirming that the rigid truck's brake was properly and effectively applied by the driver.

4.4.3 Loading procedures of the Safety Management Manual

Pursuant to the International Safety Management Code[8], Eurocargo Trieste was operating under the Company's «Procedures Manual». In this respect, amongst others, procedures and instructions were set forth in Section 2 of the Manual, titled **«The Ship in Port».**

4.4.3.1 Supervision and Control

Under par. 2.1 «Cargo Operations and Responsibilities» the loading-unloading operations, inter alia, were carried out under:

- the Master's responsibility;
- the Master's and Chief Officer's supervision with assistance of the Duty Officers and the watch keeping personnel; while
- the securing procedure of the involved rigid truck has to be supervised by the Duty Officer.

On the day of the examined case, the standard deck personnel's positioning during the loading operation was practiced. The C/O was standing at the stern loading ramp of no. 2 garage deck (main deck), supervising and directing the loading operation and was assisted by the two Deck Officers that were positioned: One on garage deck no 2 assisted by three deck ratings and one in garage deck no.4 assisted by two deck ratings. Only 3 or 4 vehicle trailers were planned to be loaded in garage no. 3, which would be guided to the stowage position by the crew positioned on garage deck no 2.

Based on the information gathered during the investigation process, at the time the involved rigid truck stopped at the stowage position and the driver got off the tractor to carry out the uncoupling process, the only crew present was the O/S located at the rear of the semi-trailer and was already preparing the lashing equipment.

In view of the above it can be concluded that a Duty Officer for supervising the loading operation was not assigned for the garage deck no.3 for supervising the process. The lack of supervision and control by the Duty Officer during the parking and disengagement procedure of the rigid truck is considered a contributing factor in the examined case.

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[8]The International Safety Management Code adopted by resolution A.741(18), entered into force on 1 July 1998, as amended by by resolutions MSC.104 (73), MSC.179 (79), MSC.195 (80), MSC.273 (85), MSC.353 (92).

4.4.3.2 Safety considerations

In par. 2.3 «Loading of cargo», subparagraph 2.3.1 «Cargo planning» it was recorded that:

«Before the cargo is loaded the following issues should be taken into account:

a. The weights involved
b. Draft limitations
c. Permissible load limitations
d. Cargo gear and equipment limitations
e. Safety considerations
f. Stowage factors
g. Stability and stress
h. Dangerous cargo parameters
i. Environmental regulations
j. Local, national and international regulations
k. Office operational advice
I. Shippers requirements
m. Special handling considerations
n. Lashing requirements
o. Sequence of discharge, etc.».

Point (e) «safety considerations» may, amongst other issues, broadly include vehicles' parking and securing process in relation to Officers and deck crew working methods and practices and their readiness to perform their duties effectively before the cargo is loaded. Such readiness should include a short briefing by the C/O to the Deck Officers in Charge and deck personnel engaged in the loading operation. It was reported that a short briefing took place before the commencement of the loading operation however, it was focused on the stowing positions of the vehicles and safety considerations were not discussed.

Taking into account the above as well as the fact that prior to the commencement of the loading operation, crew briefing focusing on «safety considerations» is of paramount importance for the safety of the crew, persons on board and the safety of the vessel, especially in relation to parking of vehicles, trucks or wheeled based cargo units. Such briefings could indicatively highlight instructions or establish measures as indicated below[9]:

- → always keep the driver in sight;
- → if sight is lost, the parking operation should stop;
- → when a vehicle is immobilized in parking position, request the driver to secure it by applying the brake and engaging the gear after switching off the engine;
- → use any necessary signs or articles to draw the drivers' attention for safe immobilization and parking, such as signs saying 'Apply the handbrake' or whistles, especially on international itineraries where a commonly understood language is not known.

4.4.4 Implementing procedures under good practices

In light of Chapter 7 of the International Safety Management Code - Shipboard Operations, aforementioned safety considerations along with others that could be identified based on implementing procedures and good practices under good seamanship could be specified and documented in order to give prominence to safety to the Officers and the crew

[9] Can be referred to MCA Code of practice for Ro-Ro ships – Stowage and securing of vehicles

assigned with the loading operation duties as these derive principally from the respective legislation applied.

4.4.4.1 Transport & stowage of wheeled based cargoes (articulated trucks)

It is common practice for freight forwarding Companies operating in domestic or International "carriage by sea" transports to haul cargoes (groupage, fresh or frozen products etc.) either by:

- truck semi-trailers that are loaded, secured and lashed once parked on vehicle decks, or;
- unaccompanied or uncoupled semi-trailers that, following the loading and parking of the truck at the stowage position, the tractor unit is disconnected from the semi-trailer which are then secured and lashed.
- unaccompanied or uncoupled semi-trailers parked on the docks, that are connected (coupled) with Tug Master Vehicles and are driven to garage decks; parked; stowed and disconnected from the Tug Master Vehicles.

Described practices identify two methods of stowage that is proper parking of truck semi-trailers at the stowage (parking lane) position and proper parking and stowage of the unaccompanied or uncoupled cargo units either wheeled based or not.

4.4.4.2 Loading procedures of uncoupled cargo units

The analysis of the examined case unfolded and recognized that loading procedure of swap bodies cargo units, should be understood and dealt as a separate process as the truck or tug master vehicle is released from the swap bodies.

Semi-trailers, commonly carried by ships, by the nature of their design, are not supported on their landing legs during sea transport. As common practice, an uncoupled semi-trailer is supported by a trestle (trailer horse) or similar device placed in the intermediate area of the drawplate so that the connection of the fifth-wheel to the kingpin is not restricted. This method has been examined in terms of the deck's structural strength as well as the longitudinal, transverse and vertical forces applied during the voyage, especially on adverse weather conditions, and specific instructions have been incorporated to the vessels' Cargo Securing Manuals.

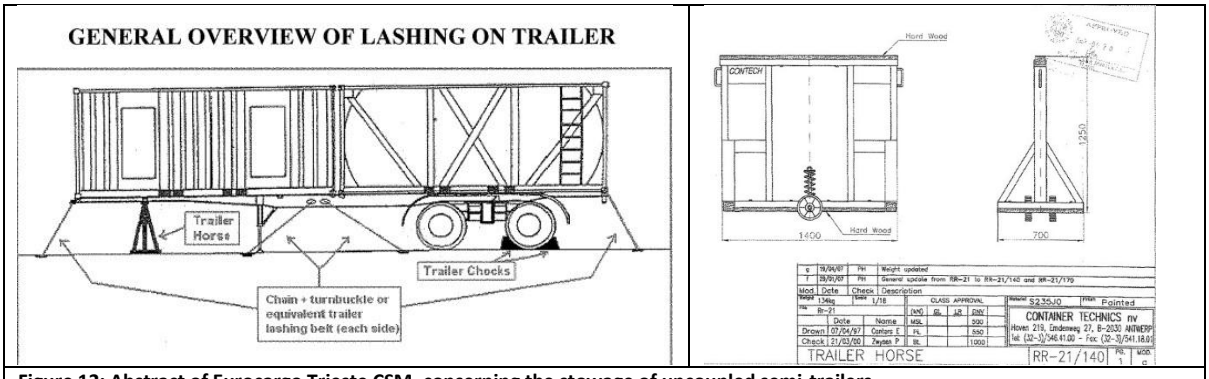

Figure 12: Abstract of Eurocargo Trieste CSM, conserning the stowage of uncoupled semi-trailers

In the examined case each Swap Body after the uncoupling from the drawbar trailer the total weight of the cargo would split on small surface of the four landing legs. For this

type of cargo stowage additional factors must be taken into account such as the strength of the deck, since all the cargo weight is divided to the small surface of the 4 pillars as well as whether the landing legs are constructed to withhold the additional forces created during a voyage with heavy pitching and rolling. However, there were no specific instructions in the vessel's CSM regarding the stowage of Swap Body cargoes which are designed to be supported in their landing legs, during their transportation. Therefore, and despite the fact that the aforementioned factors do not relay to the examined case, this type of stowage is considered a potential risk since there was no evidence that the structural capacity of the deck and the swap bodies landing legs has been examined to ensure that they can withhold the additional longitudinal, transverse and vertical forces applied during voyage.

Apart from the above, detailed securing and lashing arrangements that focus on stability issues and cargo units' shifting prevention measures during voyage, as well as proper procedures for the safe uncoupling of the Swap Body from the Drawbar trailer, including engaging the parking brakes should be documented and stressed to the Officers and crew involved with the loading operation. This becomes more imperative, considering that the physical or mental condition of a truck driver that could be affected by overconfidence, fatigue, alcohol consumption, stress etc. is not known to the Officers and crew of a Ro-Ro vessel.

Despite the fact that parking brake setting is a driver's obligation, potential omissions such as not applying the brake or not applying the brake correctly may occur. To that end a vehicle's immobilization and securing with engaging the parking brake should be controlled by the crew involved in the loading operation.

In view of the above, it derives that the steps leading to the safe immobilization; handbrake setting; and securing of a wheel-based cargo unit are subject to continuous vigilance and specific provisions should be incorporated to the CSM.

4.4.5 Safe access during Loading procedure

The vehicle deck of a ro-ro vessel is accepted as hazardous area of a ship. According to the respective provisions of the Eurocargo Trieste CSM sufficient distance should be provided between vehicles to permit safe access for the personnel when performing their duties. More specifically, the instructions for "Stowage and securing of non-standardized and semi standardized cargo" provided that:

"*9. Safe means of access to securing arrangements, safety equipment and operational controls shall be provided and properly maintained. ….. The cargo spaces should be as far as practicable, regurarly inspected during voyage.*".

In the examine case the two Swap Bodies were going to be positioned close to the starboard garage bulkhead as explained in par. 3.4. Said bulkhead had no door or any other equipment on it and so it was not expected to be used for passage by the crew during voyage. Therefore, it was considered that no minimum distance between the swap bodies and the bulkhead was required for the safe passage and the estimated space was 50 cm (Figure 7). However, as described in par. 3.4 the driver would have to enter the space between the cargo and the bulkhead in order to extract the landing legs of the

swap body, so he would have to move with difficulty in the narrow space. Moreover, when the landing legs were positioned, there would be no space for the driver to move.

In light of the above and taking into account par. 4.4.4.2, the lack of specific guidelines in the vessel's CSM concerning the stowage of swap body cargo, is considered a contributing factor as had this type of cargo been included in the CSM, a minimum safe distance from the bulkhead would have been established in order to allow safe passage for positioning the landing legs. Thus, more space for the driver could have provided sufficient time to react in order to avoid being trapped.

4.5 Parking signs on garage spaces

The parking brake is the fundamental and most important mechanism of vehicles to keep them securely motionless when parked.

It is a professional driver's obligation and practice to secure his vehicle by applying the parking brake correctly after it is immobilized in order to park it, so as to avoid any detrimental situations to people nearby or property.

Consequently, a truck driver has to be certain that the hand brake is properly applied and the vehicle is well secured at parking lanes of Ro/Ro garage decks.

The truck driver stepped off the tractor to set the landing gear mounted on the frames of the swap bodies starting from the left forward supporting leg. Yet, he missed to secure his truck by applying the parking brake before exiting the cabin.

Similar marine accidents occurred after the trucks were moved, have highlighted that truck drivers may sometimes neglect to adequately apply the parking brakes before getting off their trucks either to continue with the uncoupling of the semitrailer from the tractor or to proceed to the accommodation.

On above grounds it is considered that parking procedure should be additionally supervised and reminded to the truck drivers by the deck crew. Therefore, many Operators of Ro/Ro ships have taken measures in order to draw the attention to drivers to apply the parking brake and engage gear once parked on a vehicle deck, by placing relevant signs and labels in visible positions or using hand-held by crew instruction boards. Such methods are indicatively shown in figure 13. It is noted that this type of signs reflects also the safety procedures of the vessel operator and could encourage the crew to motivate the drivers for the engagement of the parking brake.

As it was emerged during the visit of the investigation team on the vessel, there were no signs on Eurocargo Trieste's garage spaces to draw the attention of the drivers for the engagement of the parking brake when stepping off the vehicle.

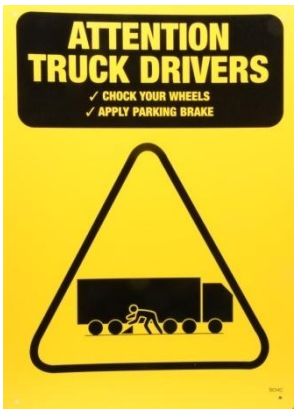

Figure 13. Indicative signs that could be used in car decks

4.6 The casualty truck driver

The truck driver was aged 69 and had been working as a driver in road international transports for more than 40 years. He had arrived at Patra's port on the 05th of October 2016 at approximately 21.30. His task, upon vessel's arrival, included the discharging of two pairs of containers and the loading of four pairs of containers respectively.

After parking the first pair of containers on Deck no.3, the driver decided to step off the truck's cabin, in order to enter the narrow corridor formed between the truck's left side and the garage plating, probably to make additional arrangements related to the position of the front container's supporting leg.

Based on the collection evidence during the investigation, it was concluded that the parking brake was not applied by the driver before exiting the cabin. Moreover, it is highly possible that the driver could not hear clearly the audible alarm, which was activated, since the parking brake was not engaged, due to the noise coming from the entrance of the engine room, located next to the truck's parking position (Figure 8).

Figure 14. Position of hand brake and visual indicator equipped with audio alarm.

Consequently, since the vessel had a small trim, 0.5m by the stern, his truck shifted forward and entrapped him between the suspended container's forward left supporting leg, and one of the garages' starboard side plating pillars.
Taking into consideration the above, the insufficient implementation of the parking brake is considered as contributing factor to the marine casualty.

4.6.1 Fatigue

According to the Presidential Decree 167/2006 (Official Government Gazette 179 A΄/22-08-2006), which regulates the working time of drivers in road transports, the average weekly working time should not exceed 48 hours.

Taking into account the above legislative framework, the investigation team requested and obtained electronic evidence, concerning the working time of the driver, as was recorded in the electronic tachograph of the truck.

From the analysis carried out it was emerged that, during the last week prior to the marine casualty, the driver's total working time was approximately 33 hours.

In addition, the day before the casualty, the truck driver started his work, heading to Patras port, at approximately 17:30 and arrived in Patras at approximately 21:00. From that time and until the next morning at approximately 08:30 the truck was immobilized. Although it was not possible to estimate how much rest the driver had during this period, there were no evidence to indicate that his performance was influenced by fatigue.

The following conclusions, safety measures and safety recommendations should not be taken as a presumption of blame or liability under any circumstances. The juxtaposition of these should not be considered with any order of priority or importance.

5. Conclusions

5.1 Conclusions and safety issues leading to safety recommendations

5.1.1 The trailer shifted as the parking brake was not applied by the truck driver when he stepped off the cabin to lower the landing legs {par. 3.4, 4.6}.

5.1.2 There was no specific reference in CSM, about the responsibility of the drivers to properly apply the parking brake of the tractors, in every case before leaving the trucks. {par. 4.4.2}.

5.1.3 The supervision and control of the loading operation in relation to parking and securing procedures was insufficient {par. 4.4.3.1}

5.1.4 There was no evidence that the swap bodies landing legs can withhold the forces applied during voyage. {par. 4.4.4.2 }.

5.1.5 There was no specific reference in CSM, regarding the swap bodies cargo units stowage, lashing and securing which are designed to be supported in their landing legs, during their transportation. {par. 4.4.4.2 }.

5.1.6 The space between the truck trailer and the garage bulkhead was 50 cm and did not provide enough space for the driver to carry out the positioning of the swap bodies' landing legs. {par. 4.4.5}.

5.1.7 Warning signs, labels, posters, or even hand-held instruction boards reminding drivers to apply the handbrake that could serve as an additional safeguard to prevent potential omissions by the drivers in applying parking brakes before leaving the trucks were not placed on the vessel's garage spaces. {par. 4.5}.

6. Actions taken

The Managers reported the following preventive actions:

1. Training and familiarization forms for the crew members that are assigned with loading and discharging operations have been amended in order to include the effective supervision and control of trucks parking brakes application.
2. Informative signs and labels have been placed on visible and conspicuous places on garage decks in order to remind drivers to apply parking brakes and engaging the engine gear at all times before stepping out of the truck.

However, no supporting material was provided during the consultation process.

7. Safety recommendations

Taking into consideration the analysis and the conclusions derived from the safety investigation conducted, the following recommendations are issued:

7.1 The Owners/Managers of Eurocargo Trieste are recommended to:

01/2016 Provide specific instructions and/or training to assigned crew members, so as to ensure that loading/unloading operations concerning the application of parking brakes are supervised and controlled effectively.

02/2016 Examine the risk factors of swap bodies' stowage in the garage spaces and supplement vessel's Cargo Securing Manual in order to ensure that there is specific instructions for transportation of this type of cargo.

03/2016 Place signs and labels on visible places in garage spaces in order to draw driver's attention for applying every time the parking brake and engaging the engine gear if necessary, before stepping out of the truck.

7.2 The Owner of the truck is recommended to:

04/2016 Provide instructions to the drivers to ensure that they apply the parking brakes of their vehicles before exiting their trucks.

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